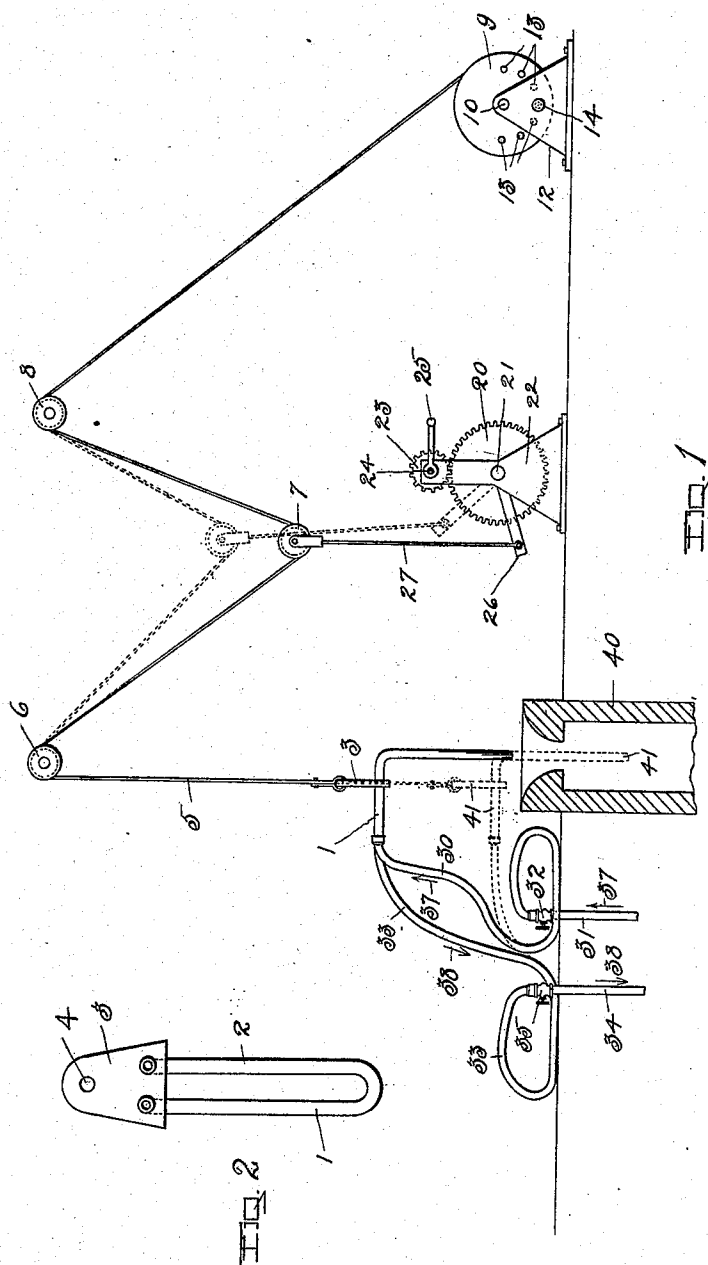


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 METHOD OF COOLING CASTINGS.
 APPLICATION FILED AUG. 17, 1907.

899,736.

Patented Sept. 29, 1908.



WITNESSES
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UNITED STATES PATENT OFFICE.

LUKE KAVANAUGH, OF WATERFORD, NEW YORK.

METHOD OF COOLING CASTINGS.

No. 899,736.

Specification of Letters Patent.

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Application filed August 17, 1907. Serial No. 388,943.

To all whom it may concern:

Be it known that I, LUKE KAVANAUGH, a citizen of the United States, residing at Waterford, county of Saratoga, and State of New York, have invented certain new and useful Improvements in Methods of Cooling Castings, of which the following is a specification.

The object of the invention is to increase the homogeneity of castings and eliminate therefrom "blow-holes," "piping" and segregations of the metal or its constituents.

The invention consists in artificially cooling the interior or inner portions of the molten mass of metal while inclosed in the mold before the mass begins to solidify, as will be hereinafter more fully described and subsequently pointed out in the claims.

The invention is particularly applicable to large castings, such as steel ingots, armor-plates, shafting, and large castings employed in the various arts.

It is well known that when large castings are allowed to cool in the mold in the manner heretofore practiced, the outer portions cool and solidify much more rapidly than the inner portions of the molten mass, leaving the interior of the mass in a liquid state after the extreme outer portions have become solid. It is equally well known that metals contract in cooling and that in large castings the outer portions become comparatively cool while the inner portions are in a molten or plastic condition. The metal is drawn away from the center with sufficient force to, in a measure, produce segregation of the metal or its constituent parts which tends to weaken the structure of the casting, sometimes called "piping." Piping takes place in certain shaped castings, as ingots, caused by the escape of gas from the interior portions of the molten mass, and "blow holes" are frequently formed in the casting due to the expansion of air or gases contained within the molds.

The improved method of cooling and agitating the mold-inclosed molten mass of metal herein described serves to permit the escape of approximately all of these gases while the central portion of the mass is still in a fluid state. The agitation of the mass increases the homogeneity of the casting, and the more rapid cooling of the inner portion of the molten mass tends to prevent segregation and improves the quality of the casting.

Any known means for introducing a non-fusing substance and maintaining the same at a non-fusing and comparatively cool temperature may be employed to agitate and cool the central portion, and afterwards withdrawn before the central portion becomes solidified.

I have shown a suitable means for carrying out the herein described invention in the accompanying drawing, in which

Figure 1 is a view in elevation of a U-shaped pipe, with means for circulating water therethrough, and mechanism for lowering such pipe into the molten mass, reciprocating it therein, and raising it therefrom. Figure 2 is a view in elevation of the pipe and the pipe-holder detached, and viewed from a direction at right angles to the direction of view in Fig. 1, this figure being drawn upon an enlarged scale.

The legs, 1 and 2, of the pipe pass through a holding plate, 3, provided with the aperture, 4, adapted to receive the operating cable, 5, which passes over a loose pulley, 6, under pulley, 7, and over loose pulley, 8, to an adjusting pulley, 9, mounted upon an axle, 10, rotary in suitable bearings in a pair of uprights 12. The pulley, 9, is provided with a series of pin-holes, 13, adapted to receive a pin, 14. The uprights, 12, are also provided with an aperture adapted to receive such pin, and the pulley, 9, may be rotated to adjust the position of the pipe-holder to differing vertical positions, and secured in any desired position by inserting the pin, 14, through such aperture in the uprights, and through one of the pin-holes 13.

As a means for communicating vertically reciprocating movements to the pipe, I have provided a gear-wheel, 20, mounted upon the axis, 21, rotary in a pair of uprights, 22, and a pinion, 23, adapted to mesh with the gear-wheel, 20, and mounted upon an axle, 24, rotary in the uprights 21. The axle is provided with a crank-handle, 25, by means of which the pinion can be rotated in either direction. The gear-wheel is provided with a lever-arm, 26, fixed thereon, and connected by a link, 27, with the loose pulley 7. When the pulley, 9, is held in a fixed position, as shown, vertically reciprocating movements may be imparted to the pipe by turning the handle, 25, first in one direction, and then in the opposite direction. One leg, 1, of the pipe is shown connected by a flexible hose, 30, with the water supply-pipe, 31, provided

with the valve, 32, and the other leg, 2, of the pipe is shown connected by a similar flexible hose, 33, with a pipe, 34, leading to a sewer or other waste place, and provided
5 with the valve 35. The arrows, 37 and 38, indicate the direction of the flow of water therethrough. An ingot-mold, 40, is shown in central longitudinal section, with the lower end broken away, and the dotted lines,
10 41, indicate the relative position of the pipe-support and connections when the pipe is lowered into the mold.

It is obvious that the legs of the pipe may be of any desired length, so that they may
15 be lowered to the bottom of the mold; also that the pipe may be reciprocated vertically in the molten metal within the mold, and withdrawn therefrom when desired; for example, before the molten metal cools sufficiently to adhere to the pipes.
20

The above means have been set forth as examples only of appropriate mechanisms for carrying out the hereindescribed invention. It is not desired, however, to be limited to the use of any particular means.
25

Any substance adapted to accomplish the purposes set forth may be employed.

It is obvious that the hereindescribed method for cooling the central portions of
30 the mold-inclosed mass of molten metal effects a considerable saving of time which is required to cool a large casting sufficiently to make it practical to remove the same from the mold.

Division having been required in this case, 35 and a divisional application having been filed embodying the method of cooling by introducing a fusible substance and allowing the same to fuse and remain in the molten mold-inclosed metal, such method is not
40 claimed herein, being claimed in such divisional application.

What I claim as new and desire to secure by Letters Patent is

1. That improvement in the art of cooling 45 metal castings which consists in introducing into the mold-inclosed mass of molten metal a non-fusing substance and maintaining therein a comparatively low temperature while the molten mass remains in a fluid
50 condition and withdrawing such substance before the molten mass solidifies.

2. That improvement in the art of cooling metal castings which consists in cooling and
55 at the same time agitating the inner portions of the mold-inclosed mass of molten metal by the movements of a non-fusing substance inserted and reciprocated therein, maintaining the inserted substance at a comparatively low temperature while contained in the
60 molten mass, and withdrawing such substance before the molten mass solidifies.

In testimony whereof, I have hereunto set my hand this 15th day of August, 1907.

L. KAVANAUGH.

Witnesses:

DELLA M. McDERMOTT,
CHARLES R. BUTTON.